REMARKS

Claims 1-33 are pending herein, claims 1, 30, 31 and 33 being independent. Claims 3-5, 9, 15-23, 25, 26 and 28-33 have been withdrawn. Claims 1, 2, 6 and 8 have been amended. No new matter has been added.

In the pending Final Office Action, the Examiner has rejected claims 1, 2, 6, 7, 10, 11, 13, 14, 24 and 27 under 35 U.S.C. § 103(a) as obvious over WO 00/40886 (Baylot, *et al.*) in view of United States Patent No. 4,162,093 (Sigmund); claim 8 under 35 U.S.C. § 103(a) as obvious over Baylot, *et al.* in view of Sigmund in view of United States Patent No. 6,000,438 (Ohm); and claim 12 under 35 U.S.C. § 103(a) as obvious over Baylot, *et al.* in view of Sigmund and in further view of United States Patent No. 6,703,127 (Davis, *et al.*). Applicants have carefully considered the Examiner's rejections, and the comments provided in support thereof, and respectfully disagree with the conclusions reached by the Examiner. For the following reasons, applicants respectfully submit that the claims present allowable subject matter in light of the references applied by the Examiner, and therefore solicit the early allowance thereof.

The following description of the invention is provided for the convenience of the Examiner and is taken from the specification. It is not intended to argue limitations not present in the claims, or to argue for an interpretation of any claim term that is other than what would be ascribed to such term by one of ordinary skill in the art upon a full and fair reading of the specification as a whole.

The invention is directed to a device for thermally insulating an undersea pipe, the device comprising a plurality of prefabricated, walled, containers holding a phase change material ("PCM") within the pipe. The device further includes a deformable thermally insulating covering that surrounds the pipe. The covering is covered by an outer case that remains in contact with the

outside surface of the insulating covering when it deforms. One way the invention differs from the prior art is that the PCM is held within the walls of each container, a feature shown nowhere in the art applied by the Examiner.

In the specification, applicants addressed the Baylot, *et al.* patent (the U.S. equivalent of which is United States Patent No. 6,978,825 – to which reference is made herein for the Examiner's convenience), and the differences to be drawn between Baylot, *et al.* and that of the instant invention. That description begins in para. [0019] of the published application herein.

As described, the difference is that, in Baylot, *et al.*, insulation is provided by a PCM that is impregnated in an absorbent matrix **2** (*see, e.g.*, col. 8, lines 63-65 of Baylot, *et al.*). Matrix **2** is described as follows:

> "[M]atrix 2 may be constituted by a light cellular or fibrous material such as open-cell foam, particularly polyurethane foam, glass or rock fiber, woven fabrics, felt, paper, etc . . . : in fact, the nature of the material constituting said matrix ***must be*** sufficiently absorbent to be compatible with the impregnation by said phase change material **4** in order to oppose the natural convection of the liquefied part 4_1 of said material . . ." (emphasis supplied) – col. 9, lines 20-26.

This differs markedly from the claimed construction which requires the confinement of the PCM in a plurality of prefabricated, walled, *containers* disposed around the pipe. Baylot, *et al.* fail to teach or suggest the use of such containers, and it is the inventors' contribution to the art to recognize the benefit of having the PCM *not* impregnated in a matrix (which impedes its ability to flow) but instead be held in walled containers, which may be inserted individually into the pipe. There is an additional benefit, as explained in para. [0028] of the published specification herein, namely that when a PCM is loaded into a matrix, as in Baylot, *et al.*, it must be loaded in a fluid form so that it will flow into the matrix. This means that it must be handled *hot*, or else the PCM will not flow. As the PCM is injected into the matrix within the pipe, the PCM tends to cool and

therefore harden, leading to the possibility of a discontinuity of the flow of the PCM into the matrix, and ultimately the provision of uneven insulation to the pipe when *in situ*. According to the invention, on the other hand, loading the PCM into a plurality of walled containers which may be simply placed within the pipe makes the loading of the PCM much easier and ensures more even distribution of the PCM in place for smooth operation of the pipe while in use. This construction also avoids the possibility of gaps or voids that may accompany the distribution of the PCM within the matrix of the prior art.

Thus, the invention as claimed is distinct from the device taught in the prior art Baylot, *et al.* patent. The Examiner has apparently conceded this distinction, as he has relied on the teachings of the Sigmund patent to overcome the deficiencies of the prior art Baylot, *et al.* patent. It is also pointed out that Baylot, *et al. expressly* state that the matrix *"must be"* absorbent, and therefore teach *away* from the use of walled containers, which, by definition do not absorb the PCM but rather hold it in place.

The addition of Sigmund overcomes none of the deficiencies, however, of Baylot, *et al.* Sigmund is directed to heat insulated pipe lines, and is specifically concerned with maintaining insulation around butt welded joints **17** of adjoining pieces of pipe **14** (*see*, col. 11, line 41, *et seq.*). Sigmund is therefore concerned with maintaining insulation around a specific portion of pipe that is subject to potential weakness.

In this context, Sigmund discloses an insulated pipe having insulating *coatings* **91, 92, 103** and **110** (it is noted that the Examiner also referred to a reference numeral **90** but that numeral does not appear in the Sigmund specification, appearing only in Fig. 3), and the Examiner has relied on the use of these *coatings* to teach the use of "containers". The Examiner does not, however, provide

any explanation of how teaching the use of a "coating" would lead one of ordinary skill in the art to use a "container". A "coating" is simply something applied to the exterior of another object, while a container is something that holds something else. In this context, the claimed insulated pipe includes a plurality of walled containers for holding a PCM used in the device, while Sigmund teaches applying a coating to a pipe to insulate it. Although the Examiner states, without support: "[I]t would have been obvious to one skilled in the art to modify the insulation in Baylot by providing coating layers to act as flexible containers for the insulation layers as suggested by Sigmund . . .", (p. 3) the Examiner offers no basis for the proposition that one of ordinary skill in the art would be motivated to modify the combination of Baylot, *et al.* and Sigmund posited by the Examiner so as to include prefabricated, walled containers, a feature which is lacking in *both* references and that is directly contrary to the express teaching of the prior art Baylot, *et al.* patent that the PCM *must be* held in an absorbent matrix.

In the Final Officer Action, the Examiner has argued that he must rely upon the broadest interpretation of "container" and takes the position that "container" embraces a "coating". While applicants disagree with this proposition, they have clarified the term "container" in the claims to refer to "prefabricated walled containers", which clearly would *not* include "coatings" such as taught by Sigmund.

It is noted that claim 1 requires that the PCM be "confined" in the containers. This also clarifies the difference between a walled container and a coating, which does not "confine" the PCM in any respect.

In other words a "container" holds the insulation PCM by itself while, in Sigmund, the coating holds the insulation material in place through cooperation with the wall of the pipe

against which the insulation material is directly in contact .The insulation material in Sigmund is not "confined" *within* the coating but it is confined *between* the coating and the pipe.

The claimed constructions provides several advantages.

A first advantage of confining the PCM in a container is explained in the specification. This confinement eliminates the risk of creating voids or gas pockets in the volume of PCM filled in the space to be filled (*see*, page 9 line 27 of the specification).

When confined within a container, the PCM material of the invention can be prefabricated and pre-filled within a container and then disposed around the pipe. This feature is therefore important because it is much easier to put the PCM into place without generating voids or gas pockets because PCM is, by its nature, viscous and therefore not easy to manipulate and not easy to put in place around the pipe, the more so when the PCM are so-called "melted salt" which are corrosive.

A second advantage of confining the PCM in container is to improve the effectiveness of the PCM. Indeed, the PCM is more efficient when it is *not* in contact with the inner pipe as explained at length in the specification. Therefore it is more efficient when confined in a container. Briefly, the reason is that the container holding the PCM acts as a heat absorber and therefore confining the PCM in walled containers increases the period of cooling of the hot crude oil circulating in the pipe when restarting the production after several days of interruption of the production as explained in pages 10-12 of the specification. The PCM slows down the cooling of the oil circulating in the pipe so as to avoid its turning solid meaning that it cannot circulate.

Confining the PCM within containers make it easier to localize the PCM in the vicinity of the inner pipe without contact with the pipe so as to improve its effectiveness.

Besides, confining the PCM within containers avoids longitudinal as well as transversal migration of the PCM . It is another goal to avoid longitudinal migration of the PCM (*see*, page 10, line 23 of the specification).

A further advantage of the use of walled containers is the fact that PCM containers can be placed just around the pipe or preferably close to the pipe, namely closer to the inner pipe than the outer case.

None of these advantages can be realized simply by the use of an applied "coating" as taught by Sigmund, as they derive from the use of "walled coatings", such as claimed herein.

It is submitted that one of ordinary skill in the art could not combine two references that *lack* prefabricated, walled containers for holding a PCM, and *must* include an absorbent material to hold the PCM, to yield a device that *has* a prefabricated, walled container and *no* absorbent material. Without some teaching in the prior art of how or why one of ordinary skill in the art would be motivated to make such a modification, the proposed primary combination fails to teach or suggest the invention as claimed herein.

The other references applied by the Examiner likewise fail to teach or suggest the use of a plurality of walled containers to hold a PCM, and the Examiner has not offered those references for that proposition. Accordingly, it is submitted that the invention as claimed is distinct from the references applied by the Examiner, taken alone or in combination. There being no further grounds for objection or rejection, early and favorable action on the presented claims is solicited.

Furthermore, since claim 1 is generic to the inventions disclosed, the allowance of claim 1 makes the remaining claims subject to rejoinder, and therefore allowance as they each contain the limitations of claim 1. MPEP § 821.04.

It is believed that no further fees are due at this time. However, in the event that any fees are required, please charge any such fees or charges required at this time in connection with the application to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
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